

Listing of Claims

1 – 15 Cancelled.

16. An apparatus comprising:

- 5 a storage medium; and
 a plurality of instructions stored in the storage medium, with the instructions
 designed to perform a selected one of intracoding of a macroblock of video data and
 decoding of an intracoded macroblock of video data, where an intracoded
 macroblock includes a MxN subblock of pixel values predicted under a first
 10 prediction mode as follows:
 where $t_0 - t_N$ and $l_0 - l_M$ are available,

$$p_{ij} = (t_0 + \dots + t_N + l_0 + \dots + l_M + N/2 + M/2) / (M + N);$$

Else if only $t_0 - t_N$ are available,

15 $p_{ij} = (t_0 + \dots + t_N + N/2) / N;$

Else if only $l_0 - l_M$ are available,

$p_{ij} = (l_0 + \dots + l_M + M/2) / M;$

Else

$p_{ij} = 128;$

20 for $i = 0 - (N-1), j = 0 - (M-1);$

 where p_{ij} are pixel values of the MxN subblock, with i and j being indices
 denoting row and columns positions within the MxN subblock;

$t_0 - t_N$ are pixel values of adjacent subblocks above the MxN subblock;

 and

25 $l_0 - l_m$ are pixel values of adjacent subblocks to the left of the MxN
 subblock.

17. The apparatus of claim 16, wherein the instructions are further designed to

perform the selected one of intracoding of a macroblock and decoding of an

30 intracoded macroblock where an intracoded macroblock includes a MxN

subblock of pixel values predicted under a second prediction mode, where a column of pixel values is predicted as follows:

where $t_0 - t_N$ are available, $P_{ij} = t_j$.

- 5 18. The apparatus of claim 16, wherein the instructions are further designed to perform the selected one of intracoding of a macroblock and decoding of an intracoded macroblock where an intracoded macroblock includes a $M \times N$ subblock of pixel values predicted under a second prediction mode, where a row of pixel values is predicted as follows
- 10 where $l_0 - l_N$ are available, $P_{ij} = l_i$.

19. The apparatus of claim 16, wherein the instructions are further designed to perform the selected one of intracoding of a macroblock and decoding of an intracoded macroblock where an intracoded macroblock includes at least a selected one of a 4×8 subblock, a 8×4 subblock and a 8×8 subblock of pixel values predicted
- 15 under a second prediction mode, where a diagonal of pixel values is predicted in accordance with a selected of:

4x8 subblock	8x4 subblock	8x8 subblock	predicted by
-	P_{07}	P_{07}	$(t_5 + t_6 \ll 1 + t_7 + 2) \gg 2$
-	P_{06}, P_{17}	P_{06}, P_{17}	$(t_4 + t_5 \ll 1 + t_6 + 2) \gg 2$
-	P_{05}, P_{16}, P_{27}	P_{05}, P_{16}, P_{27}	$(t_3 + t_4 \ll 1 + t_5 + 2) \gg 2$
-	$P_{04}, P_{15}, P_{26}, P_{37}$	$P_{04}, P_{15}, P_{26}, P_{37}$	$(t_2 + t_3 \ll 1 + t_4 + 2) \gg 2$
P_{03}	$P_{03}, P_{14}, P_{25}, P_{36}$	$P_{03}, P_{14}, P_{25}, P_{36}, P_{47}$	$(t_1 + t_2 \ll 1 + t_3 + 2) \gg 2$
P_{02}, P_{13}	$P_{02}, P_{13}, P_{24}, P_{35}$	$P_{02}, P_{13}, P_{24}, P_{35}, P_{46}, P_{57}$	$(t_0 + t_1 \ll 1 + t_2 + 2) \gg 2$
P_{01}, P_{12}, P_{23}	$P_{01}, P_{12}, P_{23}, P_{34}$	$P_{01}, P_{12}, P_{23}, P_{34}, P_{45}, P_{56}, P_{67}$	$(q + t_0 \ll 1 + t_1 + 2) \gg 2$
$P_{00}, P_{11}, P_{22}, P_{33}$	$P_{00}, P_{11}, P_{22}, P_{33}$	$P_{00}, P_{11}, P_{22}, P_{33}, P_{44}, P_{55}, P_{66}, P_{77}$	$(l_0 + q \ll 1 + t_0 + 2) \gg 2$
$P_{10}, P_{21}, P_{32}, P_{43}$	P_{10}, P_{21}, P_{32}	$P_{10}, P_{21}, P_{32}, P_{43}, P_{54}, P_{65}, P_{76}$	$(l_1 + l_0 \ll 1 + q + 2) \gg 2$

P20, P31, P42, P53	P20, P31	P20, P31, P42, P53, P64, P75	$(l_2 + l_1 \ll 1 + l_0 + 2) \gg 2$
P30, P41, P52, P63	P30	P30, P41, P52, P63, P74	$(l_3 + l_2 \ll 1 + l_1 + 2) \gg 2$
P40, P51, P62, P73	-	P40, P51, P62, P73	$(l_4 + l_3 \ll 1 + l_2 + 2) \gg 2$
P50, P61, P72	-	P50, P61, P72	$(l_5 + l_4 \ll 1 + l_3 + 2) \gg 2$
P60, P71	-	P60, P71	$(l_6 + l_5 \ll 1 + l_4 + 2) \gg 2$
P70	-	P70	$(l_7 + l_6 \ll 1 + l_5 + 2) \gg 2$

20. The apparatus of claim 16, wherein the instructions are further designed to perform the selected one of intracoding of a macroblock and decoding of an intracoded macroblock where an intracoded macroblock includes at least a selected one of a 4x8 subblock, a 8x4 subblock and a 8x8 subblock of pixel values predicted under a second prediction mode, where a diagonal of pixel values is predicted in accordance with a selected one of:

4x8 subblock	8x4 subblock	8x8 subblock	predicted by
P00	P00	P00	$(t_2 + t_1 \ll 1 + t_0 + 2) \gg 2$
P01, P10	P01, P10	P01, P10	$(t_3 + t_2 \ll 1 + t_1 + 2) \gg 2$
P02, P11, P20	P02, P11, P20	P02, P11, P20	$(t_4 + t_3 \ll 1 + t_2 + 2) \gg 2$
P03, P12, P21, P30	P03, P12, P21, P30	P03, P12, P21, P30	$(t_5 + t_4 \ll 1 + t_3 + 2) \gg 2$
P13, P22, P31, P40	P04, P13, P22, P31	P04, P13, P22, P31, P40	$(t_6 + t_5 \ll 1 + t_4 + 2) \gg 2$
P23, P32, P41, P50	P05, P14, P23, P32	P05, P14, P23, P32, P41, P50	$(t_7 + t_6 \ll 1 + t_5 + 2) \gg 2$
P33, P42, P51, P60	P06, P15, P24, P33	P06, P15, P24, P33, P42, P51, P60	$(t_8 + t_7 \ll 1 + t_6 + 2) \gg 2$
P43, P52, P61, P70	P07, P16, P25, P34	P07, P16, P25, P34, P43, P52, P61, P70	$(t_9 + t_8 \ll 1 + t_7 + 2) \gg 2$
P53, P62, P71	P17, P26, P35	P17, P26, P35, P44, P53, P62, P71	$(t_{10} + t_9 \ll 1 + t_8 + 2) \gg 2$
P63, P72	P27, P36	P27, P36, P45, P54, P63, P72	$(t_{11} + t_{10} \ll 1 + t_9 + 2) \gg 2$
P73	P37	P37, P46, P55, P64, P73	$(t_{12} + t_{11} \ll 1 + t_{10} + 2) \gg 2$
-	-	P47, P56, P65, P74	$(t_{13} + t_{12} \ll 1 + t_{11} + 2) \gg 2$
-	-	P57, P66, P75	$(t_{14} + t_{13} \ll 1 + t_{12} + 2) \gg 2$
-	-	P67, P76	$(t_{15} + t_{14} \ll 1 + t_{13} + 2) \gg 2$
-	-	P77	$(t_{15} + t_{15} \ll 1 + t_{14} + 2) \gg 2$

21. The apparatus of claim 16, wherein the instructions are further designed to perform the selected one of intracoding of a macroblock and decoding of an intracoded macroblock where an intracoded macroblock includes at least a selected one of a 4x8 subblock, a 8x4 subblock and a 8x8 subblock of pixel values predicted under a second prediction mode, where a diagonal of pixel values is predicted in accordance with a selected one of:

4x8 subblock	8x4 subblock	8x8 subblock	predicted by
-	p07	p07	$(t_6 + t_7 + 1) \gg 1$
-	p17	p17	$(t_5 + t_6 \ll 1 + t_7 + 2) \gg 2$
-	p06, p27	p06, p27	$(t_5 + t_6 + 1) \gg 1$
-	p16, p37	p16, p37	$(t_4 + t_5 \ll 1 + t_6 + 2) \gg 2$
-	p05, p26	p05, p26, p47	$(t_4 + t_5 + 1) \gg 1$
-	p15, p36	p15, p36, p57	$(t_3 + t_4 \ll 1 + t_5 + 2) \gg 2$
-	p04, p25	p04, p25, p46, p67	$(t_3 + t_4 + 1) \gg 1$
-	p14, p35	p14, p35, p56, p77	$(t_2 + t_3 \ll 1 + t_4 + 2) \gg 2$
p03	p03, p24	p03, p24, p45, p66	$(t_2 + t_3 + 1) \gg 1$
p13	p13, p34	p13, p34, p55, p76	$(t_1 + t_2 \ll 1 + t_3 + 2) \gg 2$
p02, p23	p02, p23	p02, p23, p44, p65	$(t_1 + t_2 + 1) \gg 1$
p12, p33	p12, p33	p12, p33, p54, p75	$(t_0 + t_1 \ll 1 + t_2 + 2) \gg 2$
p01, p22, p43	p01, p22	p01, p22, p43, p64	$(t_0 + t_1 + 1) \gg 1$
p11, p32, p53	p11, p32	p11, p32, p53, p74	$(q + t_0 \ll 1 + t_1 + 2) \gg 2$
p00, p21, p42, p63	p00, p21	p00, p21, p42, p63	$(q + t_0 + 1) \gg 1$
p10, p31, p52, p73	p10, p31	p10, p31, p52, p73	$(l_0 + q \ll 1 + t_0 + 2) \gg 2$
p20, p41, p62	p20	p20, p41, p62	$(l_1 + l_0 \ll 1 + q + 2) \gg 2$
p30, p51, p72	p30	p30, p51, p72	$(l_2 + l_1 \ll 1 + l_0 + 2) \gg 2$
p40, p61	-	p40, p61	$(l_3 + l_2 \ll 1 + l_1 + 2) \gg 2$

p ₅₀ , p ₇₁	-	p ₅₀ , p ₇₁	$(l_4 + l_3 \ll 1 + l_2 + 2) \gg 2$
p ₆₀	-	p ₆₀	$(l_5 + l_4 \ll 1 + l_3 + 2) \gg 2$
p ₇₀	-	p ₇₀	$(l_6 + l_5 \ll 1 + l_4 + 2) \gg 2$

22. The apparatus of claim 16, wherein the instructions are further designed to perform the selected one of intracoding of a macroblock and decoding of an intracoded macroblock where an intracoded macroblock includes at least a selected one of a 4x8 subblock, a 8x4 subblock and a 8x8 subbblock of pixel values predicted under a second prediction mode, where a diagonal of pixel values is predicted in accordance with a selected one of:

4x8 subblock	8x4 subblock	8x8 subblock	predicted by
p ₀₀	p ₀₀	p ₀₀	$(t_0 + t_1 + 1) \gg 1$
p ₁₀	p ₁₀	p ₁₀	$(t_0 + t_1 \ll 1 + t_2 + 2) \gg 2$
p ₀₁ , p ₂₀	p ₀₁ , p ₂₀	p ₀₁ , p ₂₀	$(t_1 + t_2 + 1) \gg 1$
p ₁₁ , p ₃₀	p ₁₁ , p ₃₀	p ₁₁ , p ₃₀	$(t_1 + t_2 \ll 1 + t_3 + 2) \gg 2$
p ₀₂ , p ₂₁ , p ₄₀	p ₀₂ , p ₂₁	p ₀₂ , p ₂₁ , p ₄₀	$(t_2 + t_3 + 1) \gg 1$
p ₁₂ , p ₃₁ , p ₅₀	p ₁₂ , p ₃₁	p ₁₂ , p ₃₁ , p ₅₀	$(t_2 + t_3 \ll 1 + t_4 + 2) \gg 2$
p ₀₃ , p ₂₂ , p ₄₁ , p ₆₀	p ₀₃ , p ₂₂	p ₀₃ , p ₂₂ , p ₄₁ , p ₆₀	$(t_3 + t_4 + 1) \gg 1$
p ₁₃ , p ₃₂ , p ₅₁ , p ₇₀	p ₁₃ , p ₃₂	p ₁₃ , p ₃₂ , p ₅₁ , p ₇₀	$(t_3 + t_4 \ll 1 + t_5 + 2) \gg 2$
p ₂₃ , p ₄₂ , p ₆₁	p ₀₄ , p ₂₃	p ₀₄ , p ₂₃ , p ₄₂ , p ₆₁	$(t_4 + t_5 + 1) \gg 1$
p ₃₃ , p ₅₂ , p ₇₁	p ₁₄ , p ₃₃	p ₁₄ , p ₃₃ , p ₅₂ , p ₇₁	$(t_4 + t_5 \ll 1 + t_6 + 2) \gg 2$
p ₄₃ , p ₆₂	p ₀₅ , p ₂₄	p ₀₅ , p ₂₄ , p ₄₃ , p ₆₂	$(t_5 + t_6 + 1) \gg 1$
p ₅₃ , p ₇₂	p ₁₅ , p ₃₄	p ₁₅ , p ₃₄ , p ₅₃ , p ₇₂	$(t_5 + t_6 \ll 1 + t_7 + 2) \gg 2$
p ₆₃	p ₀₆ , p ₂₅	p ₀₆ , p ₂₅ , p ₄₄ , p ₆₃	$(t_6 + t_7 + 1) \gg 1$
p ₇₃	p ₁₆ , p ₃₅	p ₁₆ , p ₃₅ , p ₅₄ , p ₇₃	$(t_6 + t_7 \ll 1 + t_8 + 2) \gg 2$
-	p ₀₇ , p ₂₆	p ₀₇ , p ₂₆ , p ₄₅ , p ₆₄	$(t_7 + t_8 + 1) \gg 1$
-	p ₁₇ , p ₃₆	p ₁₇ , p ₃₆ , p ₅₅ , p ₇₄	$(t_7 + t_8 \ll 1 + t_9 + 2) \gg 2$
-	p ₂₇	p ₂₇ , p ₄₆ , p ₆₅	$(t_8 + t_9 + 1) \gg 1$

-	P ₃₇	P ₃₇ , P ₅₆ , P ₇₅	$(t_8 + t_9 \ll 1 + t_{10} + 2) \gg 2$
-	-	P ₄₇ , P ₆₆	$(t_9 + t_{10} + 1) \gg 1$
-	-	P ₅₇ , P ₇₆	$(t_9 + t_{10} \ll 1 + t_{11} + 2) \gg 2$
-	-	P ₆₇	$(t_{10} + t_{11} + 1) \gg 1$
-	-	P ₇₇	$(t_{10} + t_{11} \ll 1 + t_{12} + 2) \gg 2$

23. The apparatus of claim 16, wherein the instructions are further designed to perform the selected one of intracoding of a macroblock and decoding of an intracoded macroblock where an intracoded macroblock includes at least a selected one of a 4x8 subblock, a 8x4 subblock and a 8x8 subbblock of pixel values predicted under a second prediction mode, where a diagonal of pixel values is predicted in accordance with a selected one of:

4x8 subblock	8x4 subblock	8x8 subblock	predicted by
P ₀₀	P ₀₀	P ₀₀	$(l_0 + l_1 + 1) \gg 1$
P ₀₁	P ₀₁	P ₀₁	$(l_0 + l_1 \ll 1 + l_2 + 2) \gg 2$
P ₁₀ , P ₀₂	P ₁₀ , P ₀₂	P ₁₀ , P ₀₂	$(l_1 + l_2 + 1) \gg 1$
P ₁₁ , P ₀₃	P ₁₁ , P ₀₃	P ₁₁ , P ₀₃	$(l_1 + l_2 \ll 1 + l_3 + 2) \gg 2$
P ₂₀ , P ₁₂	P ₂₀ , P ₁₂ , P ₀₄	P ₂₀ , P ₁₂ , P ₀₄	$(l_2 + l_3 + 1) \gg 1$
P ₂₁ , P ₁₃	P ₂₁ , P ₁₃ , P ₀₅	P ₂₁ , P ₁₃ , P ₀₅	$(l_2 + l_3 \ll 1 + l_4 + 2) \gg 2$
P ₃₀ , P ₂₂	P ₃₀ , P ₂₂ , P ₁₄ , P ₀₆	P ₃₀ , P ₂₂ , P ₁₄ , P ₀₆	$(l_3 + l_4 + 1) \gg 1$
P ₃₁ , P ₂₃	P ₃₁ , P ₂₃ , P ₁₅ , P ₀₇	P ₃₁ , P ₂₃ , P ₁₅ , P ₀₇	$(l_3 + l_4 \ll 1 + l_5 + 2) \gg 2$
P ₄₀ , P ₃₂	P ₃₂ , P ₂₄ , P ₁₆	P ₄₀ , P ₃₂ , P ₂₄ , P ₁₆	$(l_4 + l_5 + 1) \gg 1$
P ₄₁ , P ₃₃	P ₃₃ , P ₂₅ , P ₁₇	P ₄₁ , P ₃₃ , P ₂₅ , P ₁₇	$(l_4 + l_5 \ll 1 + l_6 + 2) \gg 2$
P ₅₀ , P ₄₂	P ₃₄ , P ₂₆	P ₅₀ , P ₄₂ , P ₃₄ , P ₂₆	$(l_5 + l_6 + 1) \gg 1$
P ₅₁ , P ₄₃	P ₃₅ , P ₂₇	P ₅₁ , P ₄₃ , P ₃₅ , P ₂₇	$(l_5 + l_6 \ll 1 + l_7 + 2) \gg 2$
P ₆₀ , P ₅₂	P ₃₆	P ₆₀ , P ₅₂ , P ₄₄ , P ₃₆	$(l_6 + l_7 + 1) \gg 1$
P ₆₁ , P ₅₃	P ₃₇	P ₆₁ , P ₅₃ , P ₄₅ , P ₃₇	$(l_6 + l_7 \ll 1 + l_7 + 2) \gg 2$

P70, P71, P63, P72, P73	-	P70, P71, P72, P73, P74, P75, P76, P77, P62, P63, P64, P65, P66, P67, P54, P55, P56, P57, P46, P47	17
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24. The apparatus of claim 16, wherein the instructions are further designed to perform the selected one of intracoding of a macroblock and decoding of an intracoded macroblock where an intracoded macroblock includes at least a selected one of a 4x8 subblock, a 8x4 subblock and a 8x8 subblock of pixel values predicted under a second prediction mode, where a diagonal of pixel values is predicted in accordance with a selected one of:

4x8 subblock	8x4 subblock	8x8 subblock	predicted by
-	P07	P07	$(t_4 + t_5 < 1 + t_6 + 2) \gg 2$
-	P06	P06	$(t_3 + t_4 < 1 + t_5 + 2) \gg 2$
-	P05, P17	P05, P17	$(t_2 + t_3 < 1 + t_4 + 2) \gg 2$
-	P04, P16	P04, P16	$(t_1 + t_2 < 1 + t_3 + 2) \gg 2$
P03	P03, P15, P27	P03, P15, P27	$(t_0 + t_1 < 1 + t_2 + 2) \gg 2$
P02	P02, P14, P26	P02, P14, P26	$(q + t_0 < 1 + t_1 + 2) \gg 2$
P01, P13	P01, P13, P25, P37	P01, P13, P25, P37	$(l_0 + q < 1 + t_0 + 2) \gg 2$
P00, P12	P00, P12, P24, P36	P00, P12, P24, P36	$(q + l_0 + 1) \gg 1$
P10, P22	P10, P22, P34	P10, P22, P34, P46	$(l_0 + l_1 + 1) \gg 1$
P11, P23	P11, P23, P35	P11, P23, P35, P47	$(q + l_0 < 1 + l_1 + 2) \gg 2$
P20, P32	P20, P32	P20, P32, P44, P56	$(l_1 + l_2 + 1) \gg 1$
P21, P33	P21, P33	P21, P33, P45, P57	$(l_0 + l_1 < 1 + l_2 + 2) \gg 2$
P30, P42	P30	P30, P42, P54, P66	$(l_2 + l_3 + 1) \gg 1$
P31, P43	P31	P31, P43, P55,	$(l_1 + l_2 < 1 + l_3 + 2) \gg$

		P ₆₇	2
P ₄₀ , P ₅₂	-	P ₄₀ , P ₅₂ , P ₆₄ , P ₇₆	$(l_3 + l_4 + 1) \gg 1$
P ₄₁ , P ₅₃	-	P ₄₁ , P ₅₃ , P ₆₅ , P ₇₇	$(l_2 + l_3 \ll 1 + l_4 + 2) \gg 2$
P ₅₀ , P ₆₂	-	P ₅₀ , P ₆₂ , P ₇₄	$(l_4 + l_5 + 1) \gg 1$
P ₅₁ , P ₆₃	-	P ₅₁ , P ₆₃ , P ₇₅	$(l_3 + l_4 \ll 1 + l_5 + 2) \gg 2$
P ₆₀ , P ₇₂	-	P ₆₀ , P ₇₂	$(l_5 + l_6 + 1) \gg 1$
P ₆₁ , P ₇₃	-	P ₆₁ , P ₇₃	$(l_4 + l_5 \ll 1 + l_6 + 2) \gg 2$
P ₇₀	-	P ₇₀	$(l_6 + l_7 + 1) \gg 1$
P ₇₁	-	P ₇₁	$(l_5 + l_6 \ll 1 + l_7 + 2) \gg 2$

25. The apparatus of claim 16, wherein the apparatus further comprises a processor coupled to the storage medium to execute the instructions.
26. The apparatus of claim 16, wherein the apparatus comprises at least a
5 selected one of an encoder and a decoder comprising the storage medium and the instructions.
27. The apparatus of claim 26, wherein the apparatus comprises a selected one of a palm sized computing device, a wireless mobile phone, a digital personal assistant, a laptop computing device, a desktop computing device, a set-top box, a
10 server, a compact disk player, a digital versatile disk player, a television, and a display monitor.
28. The apparatus of claim 26, wherein the apparatus comprises a video daughter card and a motherboard having integrated video capability.
29. Cancelled.
- 15 30. An apparatus comprising:
a storage medium to store at least a macroblock of video data; and
logic coupled to the storage medium to perform a selected one of intracoding of a macroblock of video data and decoding of an intracoded macroblock of video

data, where an intracoded macroblock includes a MxN subblock of pixel values predicted under a first prediction mode as follows:

where $t_0 - t_N$ and $l_0 - l_M$ are available,

$$p_{ij} = (t_0 + \dots + t_N + l_0 + \dots + l_M + N/2 + M/2) / (M + N);$$

Else if only $t_0 - t_N$ are available,

$$p_{ij} = (t_0 + \dots + t_N + N/2) / N;$$

Else if only $l_0 - l_M$ are available,

$$p_{ij} = (l_0 + \dots + l_M + M/2) / M;$$

Else

$$p_{ij} = 128;$$

for $i = 0 - (N-1)$, $j = 0 - (M-1)$;

where p_{ij} are pixel values of the MxN subblock, with i and j being indices denoting row and columns positions within the MxN subblock;

$t_0 - t_N$ are pixel values of adjacent subblocks above the MxN subblock;

and

$l_0 - l_m$ are pixel values of adjacent subblocks to the left of the MxN subblock.